

## Medical measuring device

The invention relates to a medical measuring device according to claim 1.

Instead of stationary and large measuring apparatuses, small and mobile  
5 apparatuses are used more and more frequently in the medical sector, which can be carried by patients and therefore allow greater freedom of movement. An autonomous ECG recorder is known, for example, from US 5,433,209 and is designed as a portable apparatus allowing leads-off detection and alarm actuation on the portable apparatus which is implemented automatically according to a fixed sequence once the apparatus has been switched on.

10 Mobile devices of this type are generally optimized with respect to a small size and low power consumption. They therefore do not generally have detailed displays, but only small displays designed for the basic functions such as on/off or the battery status.

Devices of this type are increasingly no longer used as autonomous units, but as remote units for measuring data detection in a distributed measuring and measuring data  
15 detection system. These units then communicate with a stationary apparatus via a generally wireless communication connection, via which measuring signals are transmitted from a remote unit or a measuring apparatus to the stationary apparatus or the measuring data detection device.

However, when sensors of the remote units are placed on the body of a patient,  
20 medical staff cannot generally see a stationary apparatus with its detailed displays located in another room. Therefore they have no information about the correct placing on the body of the patient with respect to good quality of the measuring signals. For this purpose, the staff have to go to the stationary apparatus once the sensors have been placed and check the measuring signal quality. However, this is very time-consuming.

25 A further problem is that directly after the placing of sensors of a remote unit, the measuring signal quality is frequently very good but some time later deteriorates. It is therefore generally necessary for medical staff to check the measuring signal quality from time to time at the stationary apparatus. However, this is also very time-consuming.

An object of the present invention is therefore to propose a medical measuring device which is easier for medical staff to handle than the devices described at the outset, in particular requiring less time for monitoring.

5           This object is achieved by a medical measuring device with the features of claim 1. Further configurations emerge from the dependent claims.

          An essential concept of the invention consists in signaling the measuring signal quality from a sensor directly at the measuring apparatus, to which the sensor is connected. Medical staff are therefore spared the time-consuming checking of the quality of  
10   the measuring signals at a central unit like the measuring data detection device.

          The invention relates to a medical measuring device with at least one measuring apparatus which has at least one sensor for generating a measuring signal of a patient, and a measuring data detection device, which is designed to exchange the measuring signal with the at least one measuring apparatus via an, in particular, wireless communication  
15   route, wherein the at least one measuring apparatus is designed to signal the quality of the measuring signal.

          The at least one measuring apparatus is designed, in particular, to signal the quality of the measuring signal acoustically, for example by a short audio signal, when the signal quality is poor. The audio signal can thus be changed depending on the signal quality,  
20   for example it may be repeated very often in the case of very poor signal quality. Typically no audio signal is sounded when the signal quality is adequate or good.

          Alternatively or in addition, the at least one measuring apparatus can be designed to signal the quality of the measuring signal optically, for example by a display with LEDs or on an LCD.

25           The at least one measuring device is preferably a light means with different colors, each color being associated with a predetermined range of a signal quality and activated when the quality of the measuring signal is in the corresponding, predetermined range.

          The light means may also be, for example, a three-colored LED, three  
30   different colors being provided for a range of poor quality, a range of medium and a range of high quality. Red may be, for example, poor, yellow medium and green good signal quality.

          The at least one measuring apparatus is preferably designed to signal the quality of the measuring signal automatically. In this case no activation of a signalization of the measuring signal quality is necessary by medical staff.

The at least one measuring apparatus may be designed, for example, to signal the quality of the measuring signal when it is placed on a patient at another measuring site. In other words, it is triggered automatically when the measuring site is changed and signals the signal quality.

5 In addition or also alternatively, the at least one measuring apparatus can be designed to signal the quality of the measuring signal, if a substantial change in the quality of the measuring signal is detected, for example when a patient has removed one or more sensors.

10 The at least one measuring apparatus can also be designed to signal the quality of the measuring signal on demand, for example by pressing a button on the measuring apparatus or by a corresponding demand from the measuring data detection device.

In a simple embodiment, the at least one measuring apparatus is designed to signal the quality of the measuring signal in such a way that falling below a predetermined signal quality is signaled. In other words there is a threshold value in the form of the  
15 predetermined signal quality. The falling below of the threshold value can be detected by a comparator in the measuring apparatus and trigger or activate signaling.

For preferred application areas in the medical sector, the at least one measuring apparatus is designed to signal the quality of the measuring signal on the basis of an evaluation of one or more parameters such as the perfusion index, transmission level,  
20 interference level, the signal form or the like.

The at least one measuring apparatus is preferably a pulsoximeter, an ECG recorder and/or ultrasound measuring head.

25 Further advantages of the application possibilities of the present invention emerge from the following description of an embodiment of the invention with the single drawing.

30 The single Figure of the drawing shows a medical measuring device 10 in the form of a distributed medical measuring system with measuring apparatuses 12 and 14 and a central measuring data detection device 24 which is used for storing and displaying medical measuring data and for central control of the measuring apparatus 12 and 14.

The measuring data detection device 24 comprises an LCD display screen 38 for displaying medical measuring data. The medical measuring data comprise, for example, a curve pattern 42 and numerical values 40 for measuring values. The measuring data detection device 24 has various operating elements 46 for adjusting measuring parameters, the display on the screen 38 and functions of this type of the measuring data detection device 24.

The measuring device 12 is a portable ECG measuring apparatus which has a plurality of ECG electrodes 16 as sensors. As shown in the Figure, a patient 20 carries the ECG measuring apparatus 12 on his upper body, on which the ECG electrodes 16 are fastened. The ECG measuring device 12 has an ECG recorder for recording the ECG signals picked up via the ECG sensor 16. It also comprises a radio unit, with which it can build up a radio communication connection 26 with the measuring data detection device 24 for transmitting measuring signals.

To facilitate the correct placing of the ECG electrodes 16 on the upper body of the patient 20 for medical staff, the ECG measuring apparatus 12 has a three-colored LED 34 and a loudspeaker 30. The LED 34 and the loudspeaker 30 are used for optical or acoustic signaling of the quality of measuring signals which are captured via the ECG electrodes 16.

When the ECG measuring apparatus 12 detects that no measuring signal with adequate quality can be received via the ECG electrodes 16, it switches the color of the LED 34 to red to display a poor or lesser signal quality. Furthermore, an acoustic signal in the form of a short periodic audio signal sounds over the loudspeaker 30 for as long as the signal quality is not adequate.

The signal quality is checked fully automatically in the ECG measuring apparatus 12, as soon as it is switched on. It is also possible to start a test of the signal quality by actuating a signal quality test button 36 on the ECG measuring apparatus 12. This may be carried out, for example, by the patient 20 himself. When the signal quality is adequate, the ECG measuring device 12 transmits measuring signals of the ECG electrodes 16 via the radio communication connection 26 to the measuring data detection device 24 which shows the signals received, for example in the form of the curve pattern 42 on the large LCD display screen 38 and records the course of the measuring signals.

The measuring apparatus 14 is a pulsoximeter and connected to a pulsoximeter sensor 18, in which one finger 22 of the patient is located. The measuring signals of the sensor 18 are transmitted to the pulsoximeter measuring apparatus 14. The measuring apparatus comprises a comparator for comparing the signal quality of the measuring signals received with the predetermined threshold value for a predetermined signal quality. When the

signal quality received is less than the predetermined threshold value, the comparator output signal activates an LED 32 and an audio signal generator which controls the loudspeaker 28 with an audio signal. In this case, there is therefore optical and acoustic signaling that the quality of the signal of the pulsoximeter sensor 18 is not adequate to ensure reliable recording  
5 in the measuring data detection device 24.

The signal quality can then be changed by the patient or medical staff by changing the position of the pulsoximeter sensor 18 in order to receive an adequate signal quality. When the signal quality is adequate, the measuring signals are transmitted from the pulsoximeter measuring apparatus 14 via a radio communication connection 26 to the  
10 measuring data detection device 24 which displays the measuring signals received in the form of numerical values on the screen 38 and records them.

## LIST OF REFERENCE NUMERALS:

	10	medical measuring device
	12	ECG measuring apparatus
	14	pulsoximeter
	16	ECG electrodes
5	18	pulsoximeter sensor
	20	patient
	22	finger of a patient
	24	measuring data detection device
	26	radio communication connection
10	28, 30	loudspeaker
	32, 34	LED
	36	signal quality test button
	38	LCD display screen
	40	numerical values
15	42	curve pattern
	46	operating elements